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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/584,453

06/22/2006

Shinichi Inoue

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EXAMINER

WOOD, JARED M

ART UNIT

PAPER NUMBER

4181

NOTIFICATION DATE

DELIVERY MODE

11/21/2008

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

<b>Office Action Summary</b>	<b>Application No.</b> 10/584,453	<b>Applicant(s)</b> INOUE ET AL.	
	<b>Examiner</b> JARED WOOD	<b>Art Unit</b> 4181	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 03 October 2008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,2 and 4-19 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2 and 4-19 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>05/01/2007, 09/25/2006</u> .                                  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Election/Restrictions***

During a telephone conversation with **Toyohiko Konno** on **10/07/08** a provisional election was made with traverse to prosecute the invention of **claims 1-2, 4-12, and 17-19**. **Claims 13-16** were withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

**After further consideration the examiner has withdrawn the restriction requirement and claims 1-2 and 4-19 will hereafter be treated on their merits.**

### ***Specification***

The disclosure is objected to because of the following informalities:

1. On page 1, paragraph 3, line 5, the word 'gase' should read 'gas'.
2. On page 1, paragraph 3, line 6, the words 'photocatalyts' should read 'photocatalysts'.
3. On page 2, paragraph 2, line 2, the word 'is', which appears between the words 'oxide' and 'decided', should read 'are'.
4. On page 2, paragraph 3 line 9, the words 'to be' should appear between the words 'said' and 'satisfactory'.
5. On page 7, paragraph 2, line 2, the semi-colon should be replaced by a colon.
6. On page 10, paragraph 3, line 8, a period should appear after the word 'magnesia', the word 'and' after 'magnesia' should be deleted, and the word 'alumina' after

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‘magnesia and’ should be capitalized. The result should read ‘...silica/magnesia.

Alumina...’

7. On page 14, paragraph 1, line 3, the word ‘wnen’ should read ‘when’.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

**Claims 1, 2, 7, 9, 11, 12 and 17 are rejected under 35 U.S.C. 102(b) as being anticipated by Deposition of Titania Nanoparticles on Spherical Silica (Ryu et al.).**

**As to claim 1**, Ryu teaches a process for depositing titania nanoparticles on the surface of silica (inorganic oxide), **which reads on claim 9**, particles to produce a layered titania catalyst (abstract) which after sintering would be porous (page 492, paragraph 4). **As to claim 11**, Ryu teaches adjusting the pH of the TiO<sub>2</sub> and SiO<sub>2</sub> hydrosol to a preferable value of 4.5, between the isoelectric points of each, (page 491, paragraph 4) to maximize the charge difference between the TiO<sub>2</sub> and SiO<sub>2</sub> particles causing the TiO<sub>2</sub> to uniformly coat the SiO<sub>2</sub>. **In regards to claim 2**, Ryu teaches a weight ratio of TiO<sub>2</sub>/SiO<sub>2</sub> of 15% and 25% specifically. **As to claim 7**, Ryu teaches the use of a hydrosol (water as the only solvent) of SiO<sub>2</sub> (page 489, paragraph 5). **As to claims 12 and 17**, Ryu teaches sintering at 600 °C TiO<sub>2</sub> coated silica spheres to obtain a photocatalyst (page 492, paragraph 4).

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**As to claim 1**, A titanium localization index of 1.6 or more is considered to be inherent in the catalyst taught by Ryu et al. because this characteristic is dependent on the composition and process and since these are the same, the same result is inherent absent evidence to the contrary. Also the repeat distance in the crystalline lattice planes of 50 Å or less is likewise considered to be inherent in Ryu's catalyst. A catalyst produced by substantially the same process is expected to have the same properties. Applicant states in the specification that if a TiO<sub>2</sub> coating is produced according to the process described in claim 11, then the TiO<sub>2</sub> and the inorganic oxide "are presumably chemically and/or microscopically united together" (page 18, paragraph 1 of applicants specification).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

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**Claims 4-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Deposition of Titania Nanoparticles on Spherical Silica (Ryu et al.) as applied above and further in view of US 4,248,852 (Wakabayashi et al.).**

**It is to be noted that the rejection of claims 7 and 9 are alternatives to the ones defined above.**

Ryu doesn't expressly teach a pore sharpness degree of 50% or more, a pore volume of 0.03 mL/g or more, and a specific surface area of 100 m<sup>2</sup>/g or more. Ryu also doesn't teach an inorganic oxide which is needle or column-shaped. Ryu doesn't expressly teach the use of a pH swing operation to form the inorganic oxide.

Wakabayashi teaches a needle-shaped "pseudo-boehmite" structured alumina catalyst/catalyst carrier (column 1, line 20 and figure 1), formed using a pH swing operation and an alumina hydrogel (column 4, paragraphs 5 and 6 and example 1), which has a pore volume of 1.0 cc/g (1 cc = 1 mL), and a specific surface area of 300 m<sup>2</sup>/g or more (column 6, line 14). The pore volume and size distribution information in Table 1 allows a calculation of a pore sharpness degree (according to applicant's formula) of well over 50%.

It would have been obvious to use the alumina formed by the process of Wakabayashi as the inorganic oxide in place of the silica in the process and catalyst taught by Ryu in order to achieve a more desirable specific surface area and pore characteristics in the final layered catalyst. The motivation to do so would be to improve the performance of the catalyst by providing more desirable surface and pore characteristics since the surface area and pore characteristics in the final catalyst would optimize the final product due to the increase in reaction surface provided.

**Claims 13, 18, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Deposition of Titania Nanoparticles on Spherical Silica (Ryu et al.) as applied above and further in view of WO 03/011762 (Inoue et al., text of US 2004/0238410 will be cited for applicant's convenience).**

**As to claim 13**, Ryu teaches a process of coating SiO<sub>2</sub> spheres (inorganic oxide) with TiO<sub>2</sub> by adjusting the pH of a solution to a point between the isoelectric points of TiO<sub>2</sub> and SiO<sub>2</sub>.

Ryu doesn't expressly teach the use of TiCl<sub>4</sub>, Ti(SO<sub>4</sub>)<sub>2</sub>, or TiOSO<sub>4</sub> to adjust the pH of the solution.

Inoue teaches the use of TiCl<sub>4</sub>, Ti(SO<sub>4</sub>)<sub>2</sub>, or TiOSO<sub>4</sub> to adjust the pH of the described solution (paragraph 59).

Because of the desire to coat the inorganic oxide with TiO<sub>2</sub>, it would have been obvious to one of ordinary skill in the art at the time of the invention to use the titanium salts of Inoue to adjust the pH of the solution of Ryu in order to maintain or increase the purity of the TiO<sub>2</sub> layer.

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While Ryu cites the desirability of using TiO<sub>2</sub> nanoparticles as a catalyst support (page 498, paragraph 1), Ryu doesn't expressly teach the following: using the layered oxide as a carrier for a catalytic metal.

**As to claims 18 and 19**, Inoue teaches the use of a group 4 metal oxide (such as TiO<sub>2</sub>) as a catalyst carrier for catalyst metals such as tungsten, molybdenum, cobalt, nickel, ruthenium, palladium, platinum, and vanadium and a suitable combination of these catalyst metals (paragraph 79) in order to utilize the high surface area and good pore characteristics of the produced oxide in a variety of catalyst applications such as for hydrotreating of hydrocarbon oils.

At the time of invention it would have been obvious to one of ordinary skill in the art to add a catalytic metal as taught by Inoue to the catalyst taught by Ryu in order to broaden the applicability of the catalyst to many fields, such as those defined by Inoue.

**Claims 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Deposition of Titania Nanoparticles on Spherical Silica (Ryu et al.) in view of WO 03/011762 (Inoue et al., text of US 2004/0238410 will be cited for applicant's convenience) as applied to claim 13 above and further in view of US 4,248,852 (Wakabayashi et al.).**



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Ryu doesn't expressly teach the use of a pH swing process to form the inorganic oxide.

Ryu also doesn't teach the use of a 'particle growth inhibitor' in the TiO<sub>2</sub> deposition step.

**As to claim 14** Wakabayashi teaches a needle-shaped "pseudo-boehmite" structured alumina catalyst/catalyst carrier (column 1, line 20 and figure 1), formed using a pH swing operation and an alumina hydrogel (column 4, paragraphs 5 and 6 and example 1), which has a pore volume of 1.0 cc/g (1 cc = 1 mL), and a specific surface area of 300 m<sup>2</sup>/g or more (column 6, line 14). The pore volumes and size distribution information in Table 1 allows a calculation of a pore sharpness degree (according to applicant's formula) of well over 50%.

It would have been obvious to use the alumina formed by the process of Wakabayashi as the inorganic oxide in place of the silica in the process and catalyst taught by Ryu in order to achieve a more desirable specific surface area and pore characteristics in the final layered catalyst. The motivation to do so would be to improve the performance of the catalyst by providing more desirable surface and pore characteristics since the surface area and pore characteristics in the final catalyst would optimize the final product due to the increase in reaction surface provided.

**As to claim 15**, Ryu teaches sintering the layered oxide at 600 °C to obtain a photocatalyst.

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**As to claim 16**, Inoue teaches the use of a particle growth inhibitor containing, for example, silicon, phosphorus, magnesium, calcium, aluminum, and zirconium (paragraph 35) helps to improve the heat stability of the TiO<sub>2</sub> (paragraph 34).

It would have been obvious to one of ordinary skill in the art at the time of invention to use the particle growth inhibitor taught by Inoue in the TiO<sub>2</sub> deposition process of Ryu to improve the thermal stability of the TiO<sub>2</sub>. The motivation for doing so is specifically suggested by Ryu, where, in the first paragraph, Ryu states that one of the key hindrances to the use of TiO<sub>2</sub> as a catalyst or catalyst support is its thermal instability.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure is as follows: **US 3,264,227; US 4,422,960; US 5,021,392; and US 5,633,081.**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JARED WOOD whose telephone number is (571)270-5911. The examiner can normally be reached on Monday - Friday, 7:30 am - 5:00 pm, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vickie Kim can be reached on (571)272-0579. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MICHAEL MARCHESCHI/  
Primary Examiner, Art Unit 1793

/JARED WOOD/  
Examiner, Art Unit 4181